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### (54) A device and a method for identifying graphic matter

(57) The identification device comprises a light sensor which is focused on the document to be identified by means of an optical system and which can receive light reflected on the document and emitted by light sources incorporated in the device, the light sources being tuned individually to different wavelengths. The

method comprises; the emission of light of a controlled wavelength directed towards a region of the document to be checked, the collection of the reflected light on a light sensor by means of an optical focusing system, and the transmission of the signal generated in the light sensor to an interpretation and validation microprocessor.

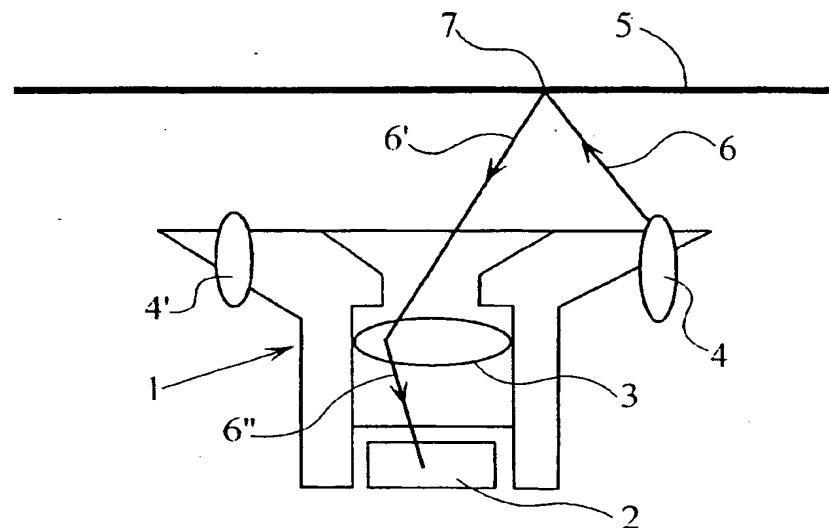


FIG. 1

## Description

[0001] The present invention relates to a device for identifying graphic matter, which is intended to examine graphic matter for the purpose of identifying printed documents on the basis of the chromatic examination of inks, paper used, and other elements which make up the document to be examined, in accordance with Claims 1 to 5.

[0002] The present invention also relates to a method of identifying graphic matter according to Claims 6 and 7.

[0003] Owing to its structure, the device affords considerable advantages, both from the point of view of novelty and with regard to inventive activity, over currently known, commercially available devices.

[0004] Within the current state of the art, various systems are known and used for examining graphic matter, and are based fundamentally on the examination of the text and of the graphic patterns of the document, such as drawings and the like, in which an analysis of lines and area is performed. However, most currently known devices suffer from large dimensions and high price, owing to the configuration of the system itself which limits its practical application.

[0005] Moreover, the known apparatus corresponding to the current state of the art have a considerable disadvantage from the point of view of its production, owing to the complex and laborious adjustment process for achieving correct operation of the apparatus which also require very critical adjustment to reach the focal distance of the lens of the CCD device and to achieve the correct illumination of the document itself.

[0006] The present invention is intended to provide a device for identifying graphic matter which is intended to solve the problems mentioned above, offering many and considerable technical advantages over the devices corresponding to the current state of the art indicated briefly above.

[0007] The identification device of the present invention is arranged for examining and identifying an image in the document being checked and also the composition of its substrate, so that there is a twofold examination of the authenticity of the document, that is, on the one hand, by checking of the authenticity of the text or graphics patterns and, on the other hand, by checking of the composition of the substrate.

[0008] The present invention is based fundamentally on one or more devices each formed by a light-sensitive sensor which is focused, by means of a lens, on the area of the document to be identified and examined.

[0009] This area is illuminated successively by means of several light emitters tuned to different wavelengths so that the sensor will receive the various values of the reflections of the light, and of its refraction through the document when two facing devices, separated by the document to be examined, are used.

[0010] The two faces of the document and the refrac-

tion in the document or in paper currency, polypropylene, etc. are thus examined simultaneously.

[0011] The information is sent in a suitable form to a microprocessor which is entrusted with its interpretation and evaluation.

[0012] One of the important contributions of the present invention to the solving of the problems of devices of the prior art relates to the fact that the focusing of the lens is not critical and does not therefore require any additional element for its adjustment, since this is not necessary. This characteristic allows the device to be mounted on a fixed support bearing the group comprising the lens, the sensor, and the light emitters, which makes the device of the present invention very simple and effective.

[0013] Moreover, since no adjustment of any type is required, the identification device of the present invention can be produced very cheaply. Moreover, the basic element of the device, that is, a light sensor, is incomparably cheaper than a CCD; by way of example, it may be mentioned that the current commercial price of the light sensor to be used in the present invention is approximately 100 times less than that of a CCD. This also applies to the rest of the components required for the interpretation of the signals generated.

[0014] The method of the invention is characterized by the emission of light of a controlled wavelength directed towards a region of the document to be checked, the collection of the reflected and refracted light on a light sensor by means of an optical focusing system, and the transmission of the signal generated in the light sensor to an interpretation and validation microprocessor.

[0015] The invention also provides for a double headed validation unit to be arranged in a manner such that the two heads are disposed one on each side of the document to be checked, permitting simultaneous, combined detection operations in the same region, but on both faces, of the substrate. The various light emitters tuned to different wavelengths can be lit successively in the same manner or differently for the two heads.

[0016] The present invention also provides for an inclined arrangement of the light emitters of the two heads so that they fall on the same region of the document to be checked.

[0017] For a better understanding thereof, drawings showing an identification device according to the present invention in schematic form are appended by way of nonlimiting example.

[0018] In appended Figure 1, the elements making up the device of the present invention are shown schematically, this embodiment permitting several variants.

[0019] Figure 2 shows an embodiment with a double head.

[0020] As shown in Figure 1, the device of the present invention is intended to examine and possibly to validate a document 5 which will consist of a document of value of any type that has predetermined characteristics both of a graphical and/or textual nature, and with regard to

the composition of the body or substrate of the document itself. The device comprises a light sensor 2, or several facing light sensors 2, receiving light beams reflected from and refracted through the substrate 5 and coming from illumination devices 4, 4'... which, as indicated above, are tuned to different wavelengths and operate separately in time, following a predetermined sequence which is fixed or is variable by means of the control microcomputer of the device, not shown. A light ray 6 is shown schematically coming from the light source 4, falling on the region 7 of the document 5 to be checked and being reflected towards the light sensor 2 in the form of a reflected ray 6', then being picked up and directed by an optical system which comprises a lens 3 focused on the document 5. A ray 6" which leaves the lens 3 is picked up by the light sensor 2 which will send the corresponding signal to the microprocessor of the device, not shown.

[0021] All of the elements of the apparatus are mounted on the same support 1 on which the said elements have fixed positions without requiring any adjustment.

[0022] Although only one unit of the device of the present invention is shown with respect the document 5 to be examined and possibly validated, it will be understood that it is possible to use, on the support 1 or on several of the said supports, several units of the device of the invention fitted, for example, in different positions relative to the document to be examined and validated, and this may include positioning relative to different faces of the said substrate in order to be able to examine the graphic patterns from both sides.

[0023] The invention also extends to the identification method which is characterized by the emission of light of a controlled wavelength directed towards a region of the document to be checked, the collection of the reflected and refracted light on a light sensor by means of an optical focusing system, and the transmission of the signal generated in the light sensor to an interpretation and validation microprocessor.

[0024] The embodiment with a double head according to Figure 2 is based on the arrangement, on the two sides of the document 12 to be checked, of respective heads 8 and 17 carrying respective facing light sensors 9 and 18 which receive the light rays reflected from and refracted through the document 12 to be checked, by means of lenses 10 and 19. The illumination devices are indicated 11 and 11' for the head 8 and 16 and 16' for the head 17 although, as will be understood, the precise number of illumination devices is not limited to that of the embodiment shown. The light beams 13 and 13' emitted by the illuminators 11 and 11' are focused on a region 14 of one of the faces of the document 12, and are reflected and refracted, for example, in the form of the rays 13", towards the lens 10, then passing to the sensor 9 which will send the corresponding signal to the control microprocessor of the device.

[0025] Similarly, the head 17 will have a variable number of illuminators 16 and 16' as well as a lens 19

for focusing the document to be tested, with the emission of light rays, for example, 15 and 15' which will fall on the region 14' opposite the region 14 of the other face of the document 12, and will be reflected and refracted in the form of rays schematically indicated 15" which, once received in the sensor 18, will bring about the generation of a signal which will be sent to the microprocessor.

[0026] The illumination devices of the heads 8 and 17 will preferably be inclined symmetrically to the axis of the head so that their axes are directed towards the region 14 for the head 8 and towards the region 14' with regard to the head 17.

[0027] In the version shown in Figure 2, the illumination devices are fitted in housings having the correct inclination to achieve the effect indicated. The illumination devices will preferably be fitted in the bodies of the heads 8 and 17 so as not to project from the corresponding front faces 20 and 21, to avoid physical contact with other external elements.

[0028] The tuning of the various light sources with different wavelengths and the cyclic nature thereof may be achieved independently in the heads 8 and 17 or in synchronized manner for both together.

## Claims

1. A device for identifying graphic matter, characterized in that it comprises a light sensor which is focused on the document to be identified by means of an optical system and which can receive light reflected on the document and emitted by light sources incorporated in the device.
2. A device for identifying graphic matter according to Claim 1, characterized in that it has a plurality of light sources tuned individually to different wavelengths.
3. A device for identifying graphic matter according to the preceding claims, characterized in that the emission of light by each of the sources is independent and separated in time from that of the other light sources.
4. A device for identifying graphic matter according to the preceding claims, characterized in that all of the elements of the device, including the optical system, the light sensor, and light emitters, are incorporated on the same support.
5. A device for identifying graphic matter according to Claim 1, characterized in that the optical system is constituted by a converging lens.
6. A method of identifying substrates bearing graphic matter, characterized by the emission of light of a

controlled wavelength directed towards a region of the document to be checked, the collection of the reflected and refracted light on a light sensor by means of an optical focusing system, and the transmission of the signal generated in the light sensor to an interpretation and validation microprocessor.

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7. A method according to Claim 6, characterized by the successive illumination of the substrate to be checked by various light emitters tuned to different wavelengths. 10

8. A method according to the preceding claims, characterized by the arrangement of two identification devices opposite one another, each device being directed towards one of the faces of the document to be checked, the light rays of the light sources being sent onto the same region of the document from the two sides thereof. 15

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9. A method according to Claim 8, characterized in that the light sources of the illumination devices and the sensors are housed inside the devices at a suitable inclination such that the rays emitted coincide in the same region of the document to be checked. 25

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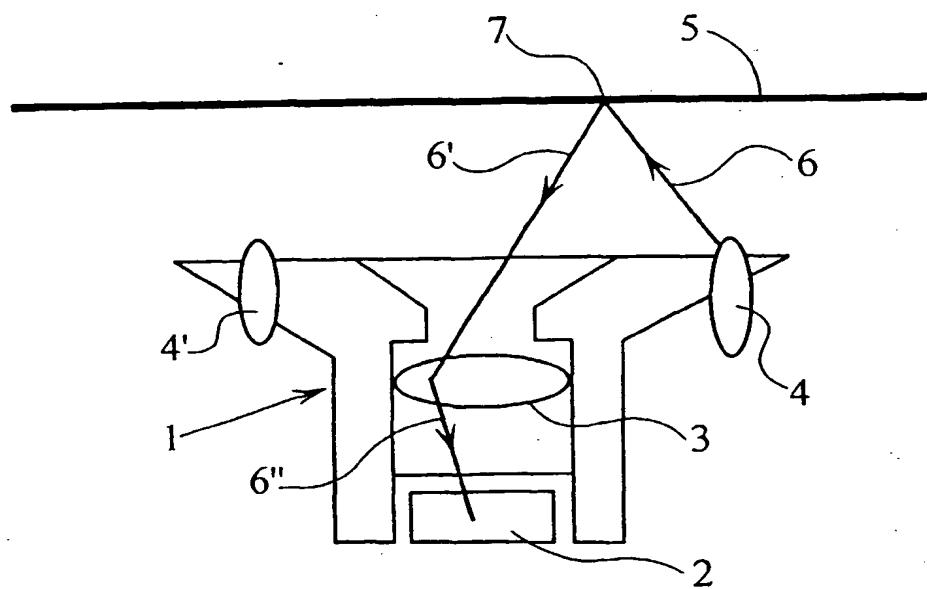


FIG. 1

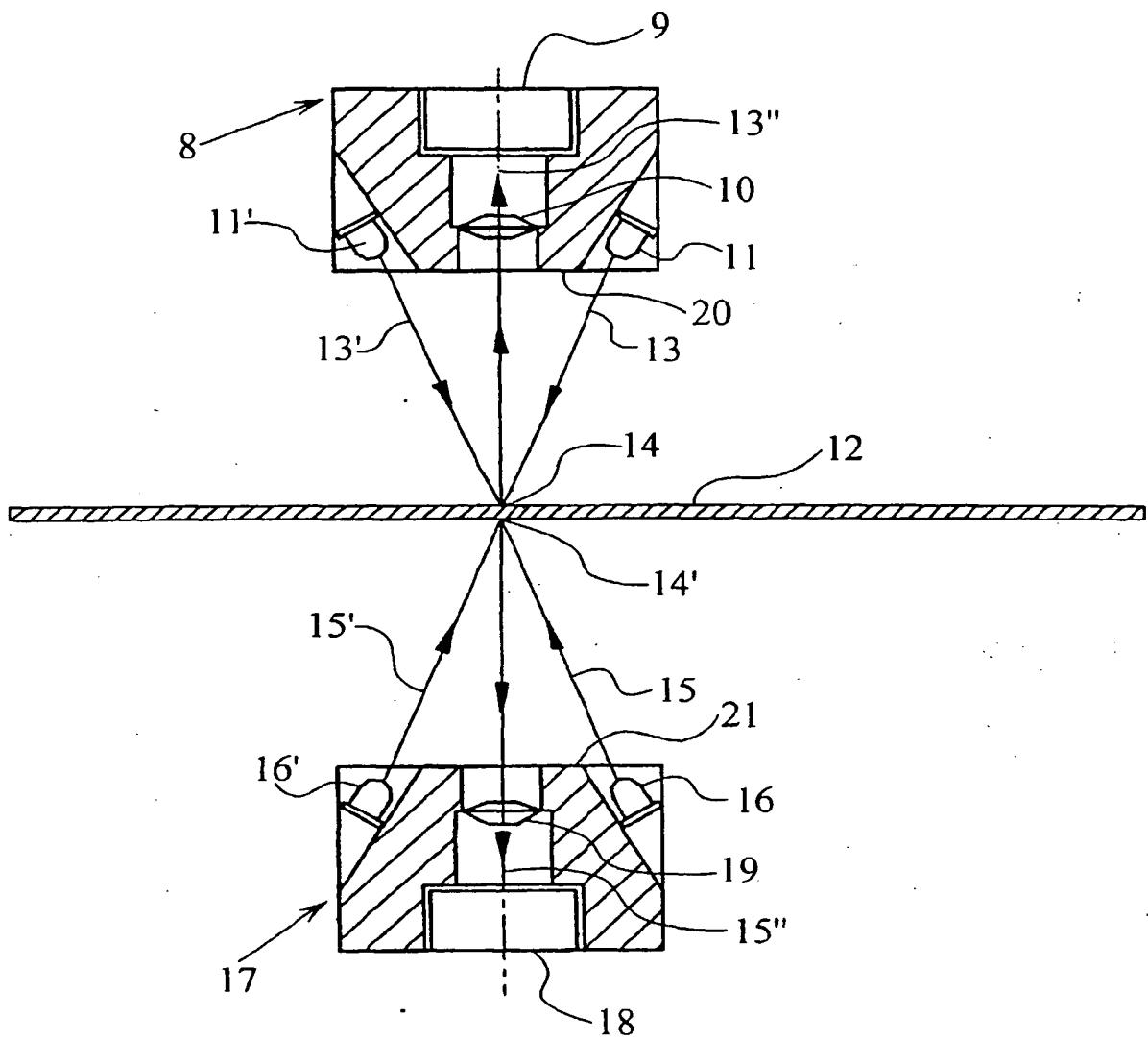
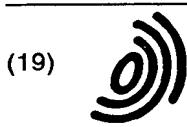


FIG. 2



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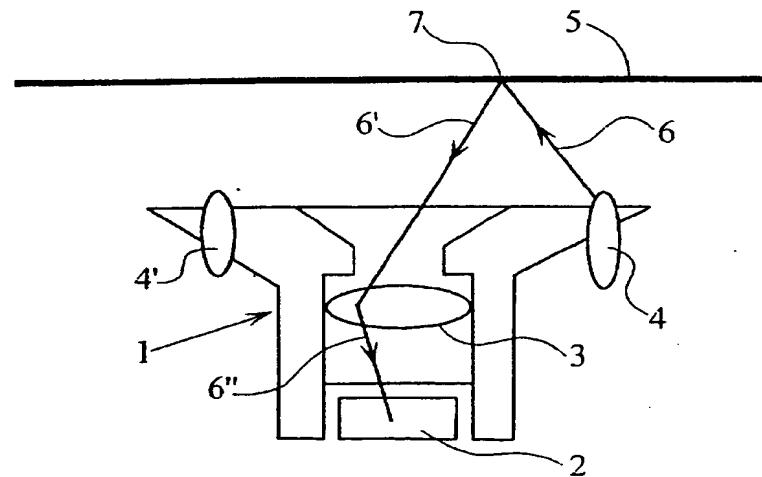


FIG. 1

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## EUROPEAN SEARCH REPORT

Application Number  
EP 00 50 0182

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int.Cl.7)	
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	G07F7/12 G07D7/12	
X	US 4 204 765 A (KOVACH ALAN J ET AL) 27 May 1980 (1980-05-27) * figure 1 * * abstract * * column 2, line 26 - column 3, line 18 *	1-4, 6, 7	G07F7/12 G07D7/12	
X	US 5 304 813 A (DE MAN IVO) 19 April 1994 (1994-04-19)	1-3, 5-9		
Y	* figures 1,2 * * column 2, line 50 - column 3, line 50 * * column 7, line 21 - line 40 *	4		
X	PATENT ABSTRACTS OF JAPAN vol. 017, no. 127 (P-1502), 17 March 1993 (1993-03-17) & JP 04 307693 A (OKI ELECTRIC IND CO LTD), 29 October 1992 (1992-10-29)	1		
A	* abstract *	6, 8, 9		
Y	US 4 618 257 A (BAYNE ROBERT T ET AL) 21 October 1986 (1986-10-21)	4	TECHNICAL FIELDS SEARCHED (Int.Cl.7)	
A	* figure 1 * * column 2, line 51 - column 4, line 22 *	1-3, 6, 7, 9	607D	
The present search report has been drawn up for all claims				
Place of search	Date of completion of the search	Examiner		
THE HAGUE	29 June 2001	Verhoef, P		
CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons S : member of the same patent family, corresponding document		
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